Alcatel·Lucent
Enterprise

Alcatel-Lucent OmniSwitch 6560

Stackable Gigabit and Multi-Gigabit Ethernet LAN Switch Family

The Alcatel-Lucent OmniSwitch™ 6560 Stackable Gigabit and Multi-Gigabit Ethernet LAN value switch family is an industry leading campus access solution for enterprise networks. With multi-gigabit ports for high-speed IEEE 802.11ac devices, 10 GigE uplinks and 20 GigE stacking, the OmniSwitch 6560 is the right solution for your next generation network.

Offering a design optimized for flexibility and scalability as well as low power consumption, the OmniSwitch 6560 is an outstanding edge solution. It uses the field-proven Alcatel-Lucent Operating System (AOS) to deliver highly available, secure, self-protective, easily managed and eco-friendly networks.

The Alcatel-Lucent OmniSwitch 6560 family is embedded with the latest technology innovations, and offers maximum investment protection.

Deployments benefiting from the OmniSwitch 6560 family are:

- Edge of small-to-mid-sized networks
- Branch office enterprise and campus workgroups
- Residential and commercially managed services applications



OmniSwitch 6560-48X4/-P48X4



OmniSwitch 6560-24X4/-P24X4



OmniSwitch 6560-P24Z8



OmniSwitch 6560-P24Z24



OmniSwitch 6560-P48Z16



OmniSwitch 6560-X10

Datasheet
Alcatel-Lucent OmniSwitch 6560

Features

- 24-port and 48-port, PoE and non-PoE with fixed small form factor pluggable (SFP+) with support for up to 6 x 10G interfaces.
- Support for 10 GigE stacking/ remote stacking or 20 GigE stacking
- Support for IEEE 802.1AE MACSec encryption
- Internal modular AC redundant power supplies

Management

- AOS field-proven software with management through web interface (WebView), command line interface (CLI), and Simple Network Management Protocol (SNMP)
- Ethernet operations, administration and management (OA&M) support for service configuration and monitoring
- Cloud enabled with OmniVista® Cirrus for a secure, resilient and scalable cloud-based network management.
- Support by Alcatel-Lucent OmniVista™ 2500 Network Management System (NMS)

Security

- MACSec encryption to secure the network edge: 1G/2.5G user and 10G up-link ports
- Flexible device and user authentication with Alcatel-Lucent Access Guardian (IEEE 802.1x/ MAC/captive portal) with Host Integrity Check (HIC) enforcement
- Enables deployment of comprehensive and secure BYoD services in enterprise networks such as guest management, device on-boarding, device posturing, application management and dynamic change of authentication (CoA).
- Advanced Quality of Service (QoS) and Access Control Lists (ACLs) for traffic control, including an embedded denial of service (DoS) engine to filter out unwanted traffic attacks
- Extensive support of user-oriented features such as learned port security (LPS), port mapping, Dynamic Host Configuration Protocol (DHCP) binding tables and User Network Profile (UNP)

Performance and redundancy

- Advanced layer-2+ features with basic layer-3 routing for both IPv4 and IPv6+
- Triple speed (100/1G/2.5G) user interfaces and fiber interfaces (SFPs) supporting 1000Base-X or 10GBase-X optical transceivers
- Up to 6 x 10G uplinks
- Precision Time Protocol (IEEE 1588v2) on 48 port models
- Wire-rate switching and routing performance
- High availability with virtual chassis concept, redundant stacking links, primary/secondary unit failover, hot-swappable power options and configuration rollback

Convergence

- Enhanced Voice over IP (VoIP) and video performance with policy-based QoS
- Future-ready support for multimedia applications with wire-rate multicast
- Airgroup™ Network Services for Bonjour speaking devices provides consistent experience over wireless and wired networks
- IEEE 802.3af, IEEE 802.3at and IEEE802.3bt PoE support for IP phones, wireless LAN (WLAN) access points and video cameras

Benefits

- Meets any customer configuration need and offers excellent investment protection and flexibility, as well as ease of deployment, operation and maintenance
- Provides outstanding performance when supporting real-time voice, data and video applications for converged scalable networks
- Ensures efficient power management, reduces operating expenses (OPEX) and lowers total cost of ownership (TCO) through low power consumption and dynamic PoE allocation, which delivers only the power needed by the attached device
- A field-upgradeable solution that makes the network highly available and reduces OPEX
- Fully secures the network at the edge at no additional cost
- Enterprise-wide cost reduction through hardware consolidation to achieve network segmentation and security without additional hardware installation
- Supports cost-effective installation and deployment with automated switch setup and configuration and end-to-end virtual LAN (VLAN) provisioning
- OmniVista® Cirrus powers a secure, resilient and scalable cloud-based network management. It offers hassle free network deployment and easy service rollout with advanced analytics for smarter decision making. IT friendly Unified Access with secure authentication and policy enforcement for users and devices.

Table 1. Available OmniSwitch 6560 models

Gigabit models	10/100/1000 RJ-45 ports	1GE SFP+ ports	1GE/10GE SFP+ uplink/ stacking ports	20 GE stacking ports	Primary power	Backup power
OS6560-24X4	24	2*	4	0	Fixed internal AC	Modular internal AC/DC
OS6560-P24X4	24	2*	4	0	Modular internal AC	Modular internal AC
OS6560-48X4	48	2*	4	0	Fixed internal AC	Modular internal AC/DC
OS6560-P48X4	48	2*	4	0	Modular internal AC	Modular internal AC
OS6560-X10	0	0	8	2	Fixed internal AC	Modular internal AC/DC

Multi-Gigabit models	10/100/1000 RJ-45 ports	Multi-Gigabit ports	1 GE/10 GE SFP+ uplink/stacking ports	20 GE stacking ports	Primary power (modular)	Backup power (modular)
OS6560-P24Z8	24	8	2	0	Internal AC	Internal AC
OS6560-P24Z24	24	24	4	2	Internal AC	Internal AC
OS6560-P48Z16	48	16	4	2	Internal AC	Internal AC

Note: All OmniSwitch Multi-Gigabit PoE ports comply with IEEE 802.3bt (95 W) and IEEE 2.5GE 802.3bz standards

Technical specification

Gigabit product matrix	OS6560-24X4	OS6560-P24X4	OS6560-48X4	OS6560-P48X4	OS6560-X10
Gigabit RJ-45 port count	24	24 PoE+	48	48 PoE+	0
1G SFP+ port count	2*	2*	2*	2*	0
1G/10G SFP+	4	4	4	4	8
20G QSFP+ stacking ports	0	0	0	0	2
MACSec capable ports	All 1G RJ45	All 1G RJ45	All 1G RJ45 2 x 1G SFP 2 x 10 SFP+	All 1G RJ45 2 x 1G SFP 2 x 10 SFP+	8 x 10G SFP+
USB port	1	1	1	1	1
IEEE 1588v2 PTP support	N/S	N/S	Yes	Yes	N/S
Console port	1	1	1	1	1
Primary slide-in PSU slot	Fixed	1	Fixed	1	Fixed
Backup slide-in PSU slot	1	1	1	1	1
Fans	1	2	2	2	2
File system flash	1 GB	1 GB	1GB	1 GB	1 GB
RAM	1 GB	1 GB	2 GB	2 GB	2 GB
Max switching ASIC capacity	168 Gb/s	168 Gb/s	216 Gb/S	216 Gb/S	240 Gb/S
Switching capacity	168 Gb/s	168 Gb/s	216 Gb/s	216 Gb/s	240 Gb/s
Throughput	125 Mpps	125 Mpps	160.7 Mpps	160.7 Mpps	178.6 Mpps
Stacking Capacity (each)	40 Gb/s	40 Gb/s	40 Gb/s	40 Gb/s	80 Gb/s
Stacking Capacity (total)	320Gb/s	320Gb/s	320Gb/s	320Gb/s	640Gb/s

Gigabit product matrix	OS6560-24X4	OS6560-P24X4	OS6560-48X4	OS6560-P48X4	OS6560-X10
System power consumption	36 W	42 W	87 W	104 W	49 W
System heat dissipation	123 (BTU/h)	143 (BTU/h)	297 (BTU/h)	355 (BTU/h)	167 (BTU/h)
Power consumption w/PoE	N/A	600 W	N/A	920 W	N/A
Heat Dissipation w/ PoE	N/A	2047 (BTU/h)	N/A	3139 (BTU/h)	N/A
Acoustics (dB) @27C*	43-54 (dBA)	45-54 (dBA)	43-54 (dBA)	45-54 (dBA)	45-54 (dBA)
MTBF (hours)	372 k	352 k	665 k	339 k	885 k
Height	4.4 cm (1.73 in)	4.4 cm (1.73 in)	4.4 cm (1.73 in)	4.4 cm (1.73 in)	4.4 cm (1.73 in)
Width	44 cm (17.33 in)	44 cm (17.33 in)	44 cm (17.33 in)	44 cm (17.33 in)	44 cm (17.33 in)
Depth	35 cm (13.78 in)	35 cm (13.78 in)	35 cm (13.78 in)	35 cm (13.78 in)	35 cm (13.78 in)
Weight	4.7 kg (10.4 lb)	4.88 kg (10.75 lb)	4.54 kg (10.0 lb)	4.68 kg (10.3 lb)	4.04 kg (8.91 lb)
Operating temperature	0° C to 45° C (32° F to 113° F)	0° C to 45° C (32° F to 113° F)	0° C to 45° C (32° F to 113° F)	0° C to 45° C (32° F to 113° F)	0° C to 45° C (32° F to 113° F)
Storage temperature	-40° C to 85° C (-40° F to 185° F)	-40° C to 85° C (-40° F to 185° F)	-40° C to 85° C (-40° F to 185° F)	-40° C to 85° C (-40° F to 185° F)	-40° C to 85° C (-40° F to 185° F)
Humidity (operating)	5% to 95% non-condensing	5% to 95% non-condensing	5% to 95% non-condensing	5% to 95% non-condensing	5% to 95% non-condensing

Multi-Gigabit product matrix	OS6560-P24Z24	OS6560-P48Z16	OS6560-P24Z8
Gigabit PoE port count	24	48	24
Multi-Gigabit port count	24	16	8
1G/10G SFP+	4	4	2
20G QSFP+ stacking ports	2	2	0
MACSec capable ports	0	All 1G/2.5G RJ45 2 x 1G SFP 2 x 10 SFP+ (*)	0
USB port	1	1	1
IEEE 1588v2 PTP support	N/S	1G & 10G ports	N/S
Console port	1	1	1
Primary slide-in PSU slot	1	1	1
Backup slide-in PSU slot	1	1	1
Fans	2	2	2
File system flash	2 GB	2 GB	2 GB
RAM	2 GB	2 GB	2 GB
Max switching ASIC capacity	336 Gb/s	336 Gb/s	112 Gb/s
Switch Capacity with 4x10GE ports and 2x20GE stacking ports (all ports, full duplex)	280 Gb/s	304 Gb/s	112 Gb/s
Switch frame rate with 4x10GE ports and 2x20GE stacking ports @ 64-byte packet	208 Mpps	226 Mpps	83.33 Mpps
Stacking Capacity (each)	80 Gb/s	80 Gb/s	40 Gb/s
Stacking Capacity (total)	640Gb/s	640Gb/s	320Gb/s
System power consumption	42 W/92 W	89 W	28 W/66 W

Multi-Gigabit product matrix	OS6560-P24Z24	OS6560-P48Z16	OS6560-P24Z8
System heat dissipation	143/314 (BTU/h)	303 (BTU/h)	95/225 (BTU/h)
Power consumption w/PoE	600 W	920 W	300 W
Heat dissipation w/PoE	2047 (BTU/h)	3140 (BTU/h)	1023 (BTU/h)
Acoustics (dB) @27C*	37-54 (dBA)	45-55 (dBA)	45-55 (dBA)
MTBF (hours)	372k/352k	296k	363k/337k
Height	4.4 cm (1.73 in)	4.4 cm (1.73 in)	4.4 cm (1.73 in)
Width	44 cm (17.33 in)	44 cm (17.33 in)	44 cm (17.33 in)
Depth	35 cm (13.78 in)	35 cm (13.78 in)	35 cm (13.78 in)
Weight	4.58 kg (10.1 lb)	4.67 kg (10.3 lb)	4.58 kg (10.1 lb)
Operating temperature	0° C to 45° C (32° F to 113° F)	0° C to 45° C (32° F to 113° F)	0° C to 45° C (32° F to 113° F)
Storage temperature	-40° C to 85° C (-40° F to 185° F)	-40° C to 85° C (-40° F to 185° F)	-40° C to 85° C (-40° F to 185° F)
Humidity (operating)	5% to 95% non-condensing	5% to 95% non-condensing	5% to 95% non-condensing

(*) Note: Only available on part number OS6560-P48Z16 (904044-90)

OmniSwitch 6560

6560 backup power supply and specifications

All OmniSwitch 6560 models support 1+1 hot-swappable secondary\redundant power supplies in a 1RU configuration, allowing for easier maintenance and replacement. Non-PoE models have a fixed, internal, primary supply and a modular, internal secondary power supply. PoE models have modular, internal, primary and secondary power supplies. The OmniSwitch 6560 PoE models also supports power load-sharing for an increase PoE power budget.

PS models	OS6560-BP	OS6560-BP-P	OS6560-BP-PH	OS6560-BP-PX
Description	Modular 150W AC power supply. Provides system power to one non-PoE switch	Modular 300-W AC power supply. Provides system and PoE power to one 24-port PoE switch	Modular 600-W AC PoE power supply. Provides system and PoE power to one 24-port PoE switch	Modular 920-W AC PoE power supply. Provides system and PoE power to one 48-port PoE switch
Dimension	4.0 cm x 7.3 cm x 18.5 cm (1.57 in x 2.87 in x 7.28 in)	4.0 cm x 7.3 cm x 18.5 cm (1.57 in x 2.87 in x 7.28 in)	4.0 cm x 7.3 cm x 18.5 cm (1.57 in x 2.87 in x 7.28 in)	4.0 cm x 7.3 cm x 18.5 cm (1.57 in x 2.87 in x 7.28 in)
Weight	.5 kg (1.11 lb)	1.00 kg (2.2 lb)	1.02 kg (2.25 lb)	1.05 kg (2.32 lb)
PoE with 1 PSU**	N/A	Up to 245 W	Up to 532 W	Up to 815 W
PoE with 2 PSU**	N/A	Up to 532 W	Up to 1085 W	Up to 1645 W
Input voltage/ current	90 V to 136 V AC/3 A 180 V to 264 VAC/1.5 A	90 V to 136 V AC/2.65 A 180 V to 264 VAC/1.5 A	90 V to 136 V AC/8.5 A 180 V to 264 V AC/ 4.25 A	90 V to 136 V AC/13 A 180 V to 264 V AC/ 6.5 A
Max output power/current	150 W/12.5 A	300 W/5.5 A	600 W/11 A	920 W/16.88 A
Power supply efficiency	90%	92%	92%	89%
Fans	1	1	1	1

** PoE budget and load sharing PoE budget is dependent on the OS6560 PoE model.

See the OS6560 Hardware User Guide for detailed information related to switch model, power supply and available power budget combinations.

Commercial references

OmniSwitch 6560 Gigabit models	
OS6560-24X4	Gigabit fixed chassis in 1RU size. Includes 24 RJ-45 10/100/1G BaseT, 2xSFP(1G) and 4xSFP+ (1G/10G) uplink/ stacking ports, internal AC supply, power cord, user guides, and 19" rack mount hardware.
OS6560-P24X4	Gigabit fixed chassis in 1RU size. Includes 24 RJ-45 10/100/1G BaseT PoE+, 2xSFP(1G) and 4xSFP+ (1G/10G) uplink/ stacking ports, 600W AC supply, power cord, user guides, and 19" rack mount hardware.
OS6560-48X4	Gigabit fixed chassis in 1RU size. Includes 48 RJ-45 10/100/1G BaseT, 2xSFP(1G) and 4xSFP+ (1G/10G) uplink/ stacking ports, internal AC supply, power cord, user guides, and 19" rack mount hardware.
OS6560-P48X4	Gigabit fixed chassis in 1RU size. Includes 48 RJ-45 10/100/1G BaseT PoE+, 2xSFP(1G) and 4xSFP+ (1G/10G) uplink/ stacking ports, 920W AC supply, power cord, user guides, and 19" rack mount hardware.
OS6560-X10	10GigE fixed chassis 8 SFP+ 10GigE, 2 QSFP+ (20G) stacking ports. 1RU size, internal AC power supply. Includes power cord, guides, and 19" rack mount hardware.
OS6560-P24Z8	Multi-GigE fixed chassis in 1RU size. Includes 8 RJ-45 100/1G/2.5G BaseT HPoE, 16 RJ-45 10/100/1G BaseT PoE and 2xSFP+ (1G/10G) ports, 300W AC supply, power cord, user guides, and 19" rack mount hardware.
OS6560-P24Z24	Multi-GigE fixed chassis in 1RU size. Includes 24 RJ-45 100/1G/2.5G BaseT HPoE, 4xSFP+ (1G/10G) and 2x20G stacking ports, 600W AC supply, power cord, user guides, and 19" rack mount hardware.
OS6560-PXZ24	A bundle of OS6560-P24Z24 with a 920W power supply. Multi-GigE fixed chassis in 1RU size. Includes 24 RJ-45 100/1G/2.5G BaseT HPoE, 4xSFP+ (1G/10G) and 2x20G stacking ports, 920W AC supply, power cord, user guides, and 19" rack mount hardware.
OS6560-P48Z16	Multi-GigE fixed chassis in 1RU size. Includes 16 RJ-45 100/1G/2.5G BaseT HPoE, 32 RJ-45 10/100/1G BaseT PoE, 4xSFP+(1G/10G) and 2x20G stacking ports, 920W AC supply, power cord, user guides and 19" rack mount hardware.
OmniSwitch 6560 power supplies	
OS6560-BP	OS6560-BP modular 150W AC non-PoE backup power supply. Provides system backup power to one OS6560 non-PoE switch. Ships with power cord.
OS6560-BP-P	OS6560-BP-P modular 300W AC PoE backup power supply. Provides system and PoE backup power to one OS6560 PoE switch. Ships with power cord.
OS6560-BP-PH	OS6560-BP-PH modular 600W AC PoE backup power supply. Provides system and PoE backup power to one OS6560 PoE switch. Ships with power cord.
OS6560-BP-PX	OS6560-BP-PX modular 920W AC PoE backup power supply. Provides system and PoE backup power to one OS6560 PoE switch. Ships with power cord.
OmniSwitch 6560 License Options	
OS6560-SW-PERF	Performance software license allowing 2 additional fixed SFP+ ports to operate at 10G speed for a total of 6 x 10G SFP+ ports.
OmniSwitch 6560 transceivers and cables	
OS6560-CBL-40	OS6560 20 Gigabit direct attached stacking copper cable (40 cm, QSFP+)
OS6560-CBL-100	OS6560 20 Gigabit direct attached stacking copper cable (100 cm, QSFP+)
OS6560-CBL-300	OS6560 20 Gigabit direct attached stacking copper cable (300 cm, QSFP+)
SFP-10G-C1M	10 Gigabit direct attached uplink/stacking copper cable (1 m, SFP+)
SFP-10G-C3M	10 Gigabit direct attached uplink/stacking copper cable (3 m, SFP+)
SFP-10G-C7M	10 Gigabit direct attached uplink/stacking copper cable (7 m, SFP+)
SFP-GIG-T	1000Base-T Gigabit Ethernet Transceiver (SFP MSA). SFP works at 1000 Mb/s speed and full-duplex mode
SFP-GIG-SX	1000Base-SX Gigabit Ethernet optical transceiver (SFP MSA)
SFP-GIG-LX	1000Base-LX Gigabit Ethernet optical transceiver (SFP MSA)
SFP-GIG-LH40	1000Base-LH Gigabit Ethernet optical transceiver (SFP MSA). Typical reach of 40 km on 9/125 µm SMF
SFP-GIG-LH70	1000Base-LH Gigabit Ethernet optical transceiver (SFP MSA). Typical reach of 70 km on 9/125 µm SMF
SFP-10G-SR	10 Gigabit optical transceiver (SFP+). Supports multimode fiber over 850 nm wavelength (nominal) with an LC connector. Typical reach of 300 m

OmniSwitch 6560 transceivers and cables (continued)	
SFP-10G-LR	10 Gigabit optical transceiver (SFP+). Supports monomode fiber over 1310 nm wavelength (nominal) with an LC connector. Typical reach of 10 km
SFP-10G-ZR	10 Gigabit optical transceiver (SFP+). Supports data transmission at 1550 nm over up to 80km single mode fiber. LC connector type.
SFP-10G-ER	10 Gigabit optical transceiver (SFP+). Supports monomode fiber over 1550 nm wavelength (nominal) with an LC connector. Typical reach of 40 km

Warranty

The OmniSwitch 6560 family comes with a Limited Lifetime Warranty.

Detailed product features

Simplified management

- Intuitive CLI in a scriptable BASH environment via console, Telnet or Secure Shell (SSH) v2 over IPv4/IPv6
- Powerful WebView Graphical Web Interface via HTTP and HTTPS over IPv4/ IPv6+
- Fully programmable RESTful web services interface with XML and JSON support. API enables access to CLI and individual mib objects
- Integrated with Alcatel-Lucent OmniVista® products for network management
- Full configuration and reporting using SNMPv1/2/3 to facilitate third-party network management over IPv4/IPv6
- File upload using USB, TFTP, FTP, SFTP or SCP using IPv4/IPv6
- Human-readable ASCII-based configuration files for off-line editing, bulk configuration and out-of-the-box auto-provisioning
- Fully programmable OpenFlow 1.3.1 and1.0 agent for control of native OpenFlow and hybrid ports
- Multiple microcode image support with fallback recovery
- Dynamic Host Configuration Protocol (DHCP) relay for IPv4/IPv6
- IEEE 802.1AB Link Layer Discover Protocol (LLDP) with Media Endpoint Discover (MED) extensions
- Network Time Protocol (NTP)
- DHCPv4 and DHCPv6 server managed by Alcatel-Lucent DNS/DHCP IP Address Management

Monitoring and troubleshooting

- Local (on the flash memory) and remote server logging (Syslog): event and command logging
- IP tools: ping and trace route
- Dying Gasp support via SNMP and syslog messages
- Loopback IP address support for management per service
- Policy- and port-based mirroring
- Remote port mirroring
- sFlow v5 and Remote Monitoring (RMON)
- Unidirectional Link Detection (UDLD), Digital Diagnostic Monitoring (DDM)

Network configuration

- Remote auto-configuration download feature
- Auto-negotiating 10/100/1000 ports automatically configure port speed and duplex setting
- Auto MDI/MDIX automatically configures transmit and receive signals to support straight-through and crossover cabling
- BOOTP/DHCP client allows auto-configuration of switch IP information for simplified deployment
- DHCP relay to forward client requests to a DHCP server
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP) with MED extensions for automated device discovery
- Multiple VLAN Registration Protocol (MVRP) for IEEE 802.1Q-compliant VLAN pruning and dynamic VLAN creation
- Auto QoS for switch management traffic as well as traffic from Alcatel-Lucent IP phones
- Network Time Protocol (NTP) for network- wide time synchronization
- Virtual chassis up to 8 units

Resiliency and high availability

- Unified management, control and virtual chassis technology
- Virtual Chassis 1+N redundant supervisor manager
- Virtual Chassis In-Service Software Upgrade (ISSU)
- Smart continuous switching technology
- ITU-T G.8032/Y1344 2010: Ethernet Ring Protection
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) encompasses IEEE 802.1D Spanning Tree Protocol (STP) and IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- Per-VLAN spanning tree (PVST+) and 1x1 STP mode
- IEEE 802.3ad/802.1AX Link Aggregation Control Protocol (LACP) and static LAG groups across modules
- Virtual Router Redundancy Protocol (VRRP) with tracking capabilities
- IEEE protocol auto-discovery
- Bidirectional Forwarding Detection (BFD) for fast failure detection and reduced re-convergence times in a routed environment
- Redundant and hot-swappable power supplies
- Built-in CPU protection against malicious attacks
- Split Virtual Chassis protection: Auto-detection and recovery of Virtual Chassis splitting due to one or more VFL or stack element failures

Advanced security

Access control

- Alcatel-Lucent Access Guardian framework for comprehensive user-policy-based NAC
- Autosensing IEEE 802.1X multi-client, multi-VLAN support
- MAC-based authentication for non-IEEE 802.1X hosts
- Web based authentication (captive portal): a customizable web portal residing on the switch
- User Network Profile (UNP) simplifies NAC by dynamically providing pre-defined policy configuration to authenticated clients — VLAN, ACL, BW

- Secure Shell (SSH) with public key infrastructure (PKI) support
- Terminal Access Controller Access-Control System Plus (TACACS+) client
- Centralized Remote Access Dial-In User Service (RADIUS) and Lightweight Directory Access Protocol (LDAP) administrator authentication
- Centralized RADIUS for device authentication and network access control authorization
- Learned Port Security (LPS) or MAC address lockdown
- Access Control Lists (ACLs); flow-based filtering in hardware (Layer 1 to Layer 4)
- DHCP Snooping, DHCP IP and Address Resolution Protocol (ARP) spoof protection
- ARP poisoning detection
- IP Source Filtering as a protective and effective mechanism against ARP attacks
- Bring Your Own Device (BYoD) provides on-boarding of Guest, IT/non-IT issued and silent devices. Restriction/ Remediation of traffic from non-compliant devices. Uses RADIUS CoA to dynamically enforce User Network Profiles based on Authentication, Profiling, Posture check of devices with OmniVista UPAM or Aruba ClearPass management applications.

Converged networks

PoE

- PoE models support Alcatel-Lucent IP phones and WLAN access points, as well as any IEEE 802.3af, IEEE 802.3at or 802.3bt compliant end device
- Configurable per-port PoE priority and max power for power allocation
- Dynamic PoE allocation: Delivers only the power needed by the powered devices (PD) up to the total power budget for most efficient power consumption

QoS

- Priority queues: Eight hardware-based queues per port for flexible QoS management
- Traffic prioritization: Flow-based QoS with internal and external (a.k.a., remarking) prioritization
- Bandwidth management: Flow-based bandwidth management, ingress rate limiting; egress rate shaping per port
- Queue management: Configurable scheduling algorithms — Strict Priority Queuing (SPQ), Weighted Round Robin (WRR)
- Congestion avoidance: Support for End-to-End Head-Of-Line (E2E-HOL) Blocking Protection
- Auto QoS for switch management traffic as well as traffic from Alcatel-Lucent IP phones

Software Defined Networking (SDN)

- Programmable AOS RESTful API
- Fully programmable OpenFlow 1.3.1 and 1.0 agent for control of native OpenFlow and hybrid ports*
- OpenStack networking plug-in*

Layer-2, Layer-3 Routing and Multicast

Layer-2 switching

- Up to 16k MAC Addresses
- Up to 4000 VLANs
- Up to 1.5k total system policies
- Latency: < 4 µs
- Max Frame: 9216 bytes (jumbo)

IPv4 and IPv6

- Static routing for IPv4 and IPv6
- RIP v1 and v2 for IPv4; RIPng for IPv6
- Up to 256 IPv4 and 128 IPv6 static and RIP routes
- Up to 128 IPv4 and 16 IPv6 interfaces
- OSPFv2 & OSPFv3 routing
- OSPFv2, OSPFv3 support

Multicast

- IGMPv1/v2/v3 snooping to optimize multicast traffic
- Multicast Listener Discovery (MLD) v1/v2 snooping+
- Up to 1000 multicast groups
- IP Multicast VLAN (IPMVLAN) for optimized multicast replication at the edge, saving network core resources

Network protocols

- DHCP relay (including generic UDP relay)
- ARP
- Generic User Datagram Protocol (UDP) relay per VLAN
- DHCP Option 82 — configurable relay agent information

*Future software development

Indicators

System LEDs

- System (OK) (chassis HW/SW status)
- PWR (primary power supply status)
- VC (virtual chassis primary)
- LED segment display indicates the Virtual Chassis ID of the unit in the stack: 1 to 2

Per-port LEDs

- 10/100/1000: PoE, link/activity
- 100/1000/2.5GE: link/activity
- 100/1000/2.5GE: PoE status
- SFP: Link/activity
- Virtual Chassis (VFL): Link/activity

Compliance and certifications

Commercial EMI/EMC

- 47 CRF FCC Part 15: 2015 Subpart B (Class A)
- VCCI (Class A limits. Note: Class A with UTP cables)
- ICES–003:2012 Issue 5, Class A
- AS/NZS 3548 (Class A) - C-Tick
- AS/NZS 3548 (Class A limits. Note: Class A with UTP cables)
- CE-Mark: Marking for European countries (Class A limits. Note: Class A with UTP cables)
- CE Emission consists of:
  - ¬ EN 50581: Standard for technical documentation for RoHS recast
  - ¬ EN 55022 (EMI and EMC requirement)
  - ¬ EN 55024: 2010 (ITE Immunity characteristics)
  - ¬ EN 61000-3-2 (Limits for harmonic current emissions)
  - ¬ EN 61000-3-3
  - ¬ EN 61000-4-2
  - ¬ EN 61000-4-3
  - ¬ EN 61000-4-4
  - ¬ EN 61000-4-5
  - ¬ EN 61000-4-6
  - ¬ EN 61000-4-8
  - ¬ EN 61000-4-11
  - ¬ IEEE802.3: Hi-Pot Test (2250 V DC on all Ethernet ports)

Safety agency certifications

- CDRH Laser
- Compliant with Restriction on Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE) directives.
- EN 60825-1 Laser
- EN 60825-2 Laser
- IEC 62368-1
- UL 60950-1, 2nd Edition, Information Technology Equipment
- CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, Information Technology Equipment

- IEC 60950-1, with all National Deviations
  - ¬ UL-AR, Argentina
  - ¬ AS/NZ TS-001 and 60950, Australia
  - ¬ ANATEL, Brazil
  - ¬ CCC, China
  - ¬ UL-GS Mark, Germany
  - ¬ KCC, Korea
  - ¬ NOM-019 SCFI, Mexico
  - ¬ CU, EAC, Russia
  - ¬ BSMI, Taiwan

Supported standards

IEEE standards

- IEEE 802.1D (STP)
- IEEE 802.1p (CoS)
- IEEE 802.1Q (VLANs)
- IEEE 802.1ad (Provider Bridge) Q-in-Q (VLAN stacking)*
- IEEE 802.1s (MSTP)
- IEEE 802.1w (RSTP)
- IEEE 802.1AE MAC Security
- IEEE 802.1X (Port Based Network Access Protocol)
- IEEE 802.3i (10Base-T)
- IEEE 802.3u (Fast Ethernet)
- IEEE 802.3x (Flow Control)
- IEEE 802.3z (Gigabit Ethernet)
- IEEE 802.3ab (1000Base-T)
- IEEE 802.3ac (VLAN Tagging)
- IEEE 802.3ad (Link Aggregation)
- IEEE 802.3ae (10 Gigabit Ethernet)
- IEEE 802.3af (Power-over-Ethernet)
- IEEE 802.3at (Power-over-Ethernet)
- IEEE 802.3bt (Power-over-Ethernet)
- IEEE 802.3az (Energy Efficient Ethernet)
- IEEE 802.3bz (2.5GE Multi-Gigabit Ethernet)
- IEEE 1588v2 Precision Timing Protocol (PTP)

ITU-T recommendations

- G.8032/Y.1344 2010: Ethernet Ring Protection (ERPv2)

IETF RFCs

RIP

- RFC 1058 RIP v1
- RFC 1722/1723/1724/2453 RIP v2 and MIB
- RFC 1812/2644 IPv4 Router Requirement
- RFC 2080 RIPng for IPv6

OSPF

- RFC 1850/2328 OSPF v2 and MIB
- RFC 2154 OSPF MD5 Signature
- RFC 2370/3630 OSPF Opaque LSA
- RFC 3623 OSPF Graceful Restart
- RFC 1765 OSPF Database Overflow
- RFC 3101 OSPF NSSA
- RFC 5838 MIB for OSPFv3
- RFC 4552 Authentication for OSPFv3
- RFC 5340/5838 OSPF v3 and MIB

IP Multicast

- RFC 1112 IGMP v1
- RFC 2236/2933 IGMP v2 and MIB
- RFC 2365 Multicast
- RFC 3376 IGMPv3 for IPv6

IPv6

- RFC 1886 DNS for IPv6
- RFC 2292/2373/2374/2460/2462
- RFC 2461 NDP
- RFC 2463/2466 ICMP v6 and MIB
- RFC 2452/2454 IPv6 TCP/ UDP MIB
- RFC 2464/2553/2893/3493/3513
- RFC 3056 IPv6 Tunneling
- RFC 3542/3587 IPv6
- RFC 4007 IPv6 Scoped Address Architecture
- RFC 4193 Unique Local IPv6 Unicast Addresses

Manageability

- RFC 854/855 Telnet and Telnet options
- RFC 959/2640 FTP
- RFC 1350 TFTP Protocol
- RFC 1155/2578-2580 SMI v1 and SMI v2
- RFC 1157/2271 SNMP
- RFC 1212/2737 MIB and MIB-II
- RFC 1213/2011-2013 SNMP v2 MIB
- RFC 1215 Convention for SNMP Traps
- RFC 1573/2233/2863 Private Interface MIB
- RFC 1643/2665 Ethernet MIB
- RFC 1867 Form-based File Upload in HTML
- RFC 1901-1908/3416-3418 SNMP v2c
- RFC 2096 IP MIB
- RFC 2131 DHCP Server/Client
- RFC 2388 Returning Values from Forms: multipart/form-data
- RFC 2396 Uniform Resource Identifiers (URI): Generic Syntax
- RFC 2570-2576/3410-3415/3584 SNMP v3
- RFC 2616 /2854 HTTP and HTML
- RFC 2667 IP Tunneling MIB
- RFC 2668/3636 IEEE 802.3 MAU MIB
- RFC 2674 VLAN MIB
- RFC 3023 XML Media Types
- RFC 3414 User-based Security Model
- RFC 3826 (AES) Cipher Algorithm in the SNMP User-based Security Model
- RFC 4122 A Universally Unique IDentifier (UUID) URN Namespace
- RFC 4234 Augmented BNF for Syntax Specifications: ABNF
- RFC 4251 Secure Shell Protocol Architecture
- RFC 4252 The Secure Shell (SSH) Authentication Protocol
- RFC 4627 JavaScript Object Notation (JSON)
- RFC 5424 The Syslog protocol
- RFC 6585 Additional HTTP Status Codes

Security

- RFC 1321 MD5
- RFC 1826/1827/4303/4305 Encapsulating Payload (ESP) and crypto algorithms
- RFC 2104 HMAC Message Authentication
- RFC 2138/2865/2868/3575/2618 RADIUS Authentication and Client MIB
- RFC 2139/2866/2867/2620 RADIUS Accounting and Client MIB
- RFC 2228 FTP Security Extensions
- RFC 2284 PPP EAP
- RFC 2869/2869bis RADIUS Extension
- RFC 4301 Security Architecture for IP

Quality of service

- RFC 896 Congestion control
- RFC 1122 Internet Hosts
- RFC 2474/2475/2597/3168/3246 DiffServ
- RFC 3635 Pause Control
- RFC 2697 srTCM*
- RFC 2698 trTCM*

Others

- RFC 791/894/1024/1349 IP and IP/Ethernet
- RFC 792 ICMP
- RFC 768 UDP
- RFC 793/1156 TCP/IP and MIB
- RFC 826 ARP
- RFC 919/922 Broadcasting Internet Datagram
- RFC 925/1027 Multi-LAN ARP/Proxy ARP
- RFC 950 Subnetting
- RFC 951 BOOTP
- RFC 1151 RDP
- RFC 1191 Path MTU Discovery
- RFC 1256 ICMP Router Discovery
- RFC 1305/2030 NTP v3 and Simple NTP
- RFC 1493 Bridge MIB
- RFC 1518/1519 CIDR
- RFC 1541/1542/2131/3396/3442 DHCP
- RFC 1757/2819 RMON and MIB

- RFC 2131/3046 DHCP/BootP Relay
- RFC 2132 DHCP Options
- RFC 2251 LDAP v3
- RFC 2338/3768/2787 VRRP and MIB
- RFC 3021 Using 31-bit Prefixes
- RFC 3060 Policy Core
- RFC 3176 sFlow

*Future AOS software feature

Services and support

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